

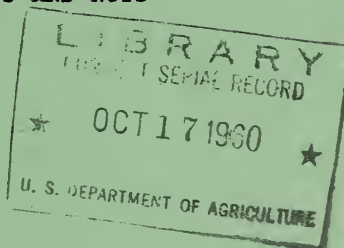
Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

A93.6
P69
Cop. 2

SERIES I. EVALUATION OF FOREIGN FRUITS AND NUTS

NO. 10. WALNUTS



EVALUATION OF PERSIAN WALNUT INTRODUCTIONS

by

R. L. SMITH, L. E. JOLEY AND W. E. WHITEHOUSE

U. S. PLANT INTRODUCTION STATION, CHICO, CALIFORNIA
New Crops Research Branch
Crops Research Division
Agricultural Research Service
United States Department of Agriculture

July 1960

CR 44-60

THE UNIVERSITY OF CHICAGO

LIBRARY

1911

THE UNIVERSITY OF CHICAGO

LIBRARY

1911

THE UNIVERSITY OF CHICAGO

LIBRARY

1911

THE UNIVERSITY OF CHICAGO

LIBRARY

1911

THE UNIVERSITY OF CHICAGO

LIBRARY

1911

THE UNIVERSITY OF CHICAGO

LIBRARY

1911

This is a progress report on the evaluation of foreign fruits prepared as a cooperative service to state and federal experiment stations, the interpretation of which may be modified with additional experimentation. Varietal names listed are those under which the material was introduced. Publication, display or distribution of any data or any statement herein should not be made without prior written approval of the Crops Research Division, A.R.S., U.S. Department of Agriculture.

Evaluation of Persian Walnut Introductions
U. S. Plant Introduction Station
Chico, California

R. L. Smith¹, L. E. Joley¹, and W. E. Whitehouse²

INTRODUCTION

This report summarizes evaluation data on a collection of Walnuts (Juglans regia L.) growing at the U. S. Plant Introduction Station, Chico, California, with special reference to climatic variations. This collection, averaging 20 years of age or older, consists of 149 seedlings representing 67 introductions from 12 countries, plus varieties Manregian (P.I. 18256), Sorrentina (P.I. 33189), and Wheeler Franquette. For comparison purposes, nuts of the varieties Eureka, Franquette, Hartley, and Payne have been included.

PROCEDURE

The data compiled for this paper were taken during 1943 to 1946 with additional information added in 1958 and 1959. Factors evaluated were dates of first terminal leafing and full bloom, dichogamy, yield, harvest season, average diameter and shape of nut, separation, percentage, average weight and color of kernels, and eating quality. The first terminal leafing dates were determined when approximately 5 percent of the terminal leaves over the entire tree had grown to approximately one-fourth inch. Dates of full male bloom were determined when about 75 percent of the catkins were shedding pollen and full female bloom when about 75 percent of the pistillate flowers were expanded.

The countries of source (Table 1) are listed alphabetically and under each the seedlings are arranged from earliest to latest average date of first terminal leafing for 1948 and 1949. Dates of first terminal leafing are used since it is felt that they are a more reliable index of the end of the dormant period than are blossoming dates.

Under dichogamy (Table 1) the flowering of individuals is considered pro-tandrous (Pa) when pollen shedding occurs before the pistillate flowers are receptive and protogynous (Pg) when the pistillate flowers are receptive before pollen shedding.

The harvest season of each introduction was designated, early (E) for those ripening with Payne, generally the last week of September; mid-season (M) for individuals ripening with Hartley and Eureka, usually Mid-October, or late (L) for those maturing with Franquette, often the last week of October.

¹/ Horticulturist, Chico, California

²/ Horticulturist, Supervisory, Beltsville, Maryland

Any which ripened later than November 1 were designated very late (VL).

The nut and kernel characteristics were averages of 10 or more nuts in most instances and represent a particular year when the information could be obtained.

The average diameter was based on measurements taken at the widest cross-sectional area of the nut.

The shapes of these walnuts, with but few exceptions, were compared either with Payne (P) which is nearly round, Franquette (F) which is slightly oblong or Eureka (E) which is oblong.

Separation refers to the ease with which the kernel cracks out of the shell. This ranges from poor (P) where broken pieces of kernel remain tightly wedged in the shell; through fair (F), where whole kernels or large pieces can be cracked out but often with some difficulty, to good (G), where whole kernels can be cracked out with comparative ease.

Percentage of kernel expresses the weight of the kernel in relation to the weight of the whole nut, while the kernel weight is an indication of its relative size.

The color classification for kernels was based on the U.S.D.A. Agricultural Marketing Service, Walnut Control Board Color Chart (11). They were classified by this chart as either extra light, light, light amber or amber when over 50 percent of the kernels of any selection would fall into one of the color classifications.

Table 2 was arranged to indicate the relationship between source and date of first terminal leafing for each seedling in 1948 and 1949.

The weather data presented in Table 3 was compiled from official weather bureau records taken at a weather station located approximately 1/2 mile from the walnut introductions. This table shows the average temperatures with departure from normal, total precipitation with departure from normal and cumulative summations of hours of temperature below 45°F. in monthly periods from September to April 30 for 1947-48 and 1948-49.

PHENOLOGY

In the spring of 1948 there was a spread of 55 days from the time the earliest seedling showed first terminal leaves to the latest (Table 2), whereas in 1949 all of the seedlings started growth within a 23 day period.

As indicated in Table 3, October, November, and December of 1947 had below normal average monthly temperatures followed by a warm January which averaged 48.8°F. or 2.9°F. above normal. This was the warmest January in 34 years with 7 days during the month that had maximum temperatures of 65°F. or over. February turned cool again with an average temperature of 46.8°F. or 2.3°F. below the February normal. The dormant season for

1948-49 was unusually cold. Both November and December had below average temperatures and January 1949 was one of the coldest months on record for Chico, averaging 37.5°F., a deficiency of 8.4°F. February and March were also below normal by 3.5 and 2.9°F. respectively.

EVALUATION

In the following summary the walnut introductions are discussed by country of source listing both the average characteristics within each group along with observations pertaining to selections of special interest.

Afghanistan

The trend, although variable, was toward earliness of leafing and blossoming among the introductions from Afghanistan with generally early to mid-season harvest. General size, appearance and quality of the nuts was good, comparing favorably with commercial varieties grown in the Chico area. The average crackout percentage and kernel size would also meet commercial standards. Although kernel color tends to be dark, with the majority classified light amber, the following four seedlings produced light colored kernels: P.I. 127460 at orchard location D 42-13¹, P.I. 159562, P.I. 159566, and P.I. 163539. Of special interest among the lightkerneled selections is P.I. 159562, for its lateness of bloom, good quality of kernel, kernel separation, and cropping record. The parent tree of P.I. 163539 is reported to have grown at 7000 ft. where minimum temperatures of -30°F. have been recorded. It produces paper shell nuts of good flavor (10). Others of interest are P.I. 159558, a protogynous selection with an early harvest season producing large nuts of good kernel size and quality, and P.I. 159568 that also matures early and has good nut and kernel size. This latter selection has also shown evidence of blight resistance at Davis, California (7).

Although the introductions from Afghanistan are known to come from areas with considerable cold, seedlings of 5 selections from this source have failed to survive at Morden, Canada (9). Clones of 5 accessions were killed at Hermiston, Oregon, by a November freeze (4) and at Norris, Tennessee, the trial of 3 clones proved they were too susceptible to spring frosts (14). Seedlings of 23 selections grown at Cheyenne, Wyoming, since 1950 were killed to the ground by a December 1959 freeze of -24°F. (3). One seedling at Salem, Ohio, shows some promise of being cold hardy (8).

¹/ The orchard location is given to identify the seedling described where there is more than one seedling of an introduction under evaluation.

Algeria

There was only a single representative from Algeria. It is about mid-season in bloom and produces nuts of good size, although many of the kernels darken and shrivel under Chico conditions.

Bulgaria

The introductions from Bulgaria tend to bloom in mid-season and produce nuts with small dark kernels of only fair quality.

Chile

The one introduction from this source P.I. 265716 may be of interest for its apparent low chilling requirements and early maturing nuts of good kernel size and quality.

China

The four introductions from China tend to leaf out and bloom early. One from this source, P.I. 125248, is of interest for its good cropping record, large size nuts of good quality, and kernels which are mostly light colored. A seedling selection P.I. 18256, of particular merit from this source, has been named Manregian and has demonstrated cold hardiness in Oregon. Its seedlings have also been reported to withstand -20°F. in the New England states (6). The indications in Michigan, however, are that Manregian and some of its seedlings are less hardy than Carpathian types (5).

In a search for better walnut rootstocks conducted by Oregon State College, Manregian rated the highest of all the English walnuts tested for germination, seedling height, caliper, and uniformity of growth (15).

Estonia

Trees from this source tended to leaf out and bloom later than the average accession. As a group the Estonian walnuts averaged the smallest size of those tested at Chico. The typical kernel was small and light amber in color. Selection P.I. 265719 is of interest for its light colored kernels and very good separation.

Although walnuts from Estonia should possess cold hardiness seedlings of 7 introductions failed to survive at Morden, Canada. Two clonal selections

were killed by a November freeze at Hermiston, Oregon, and at Norris, Tennessee, 2 clones proved too susceptible to late spring frosts. However, seedling progeny of two selections show some cold hardiness at Salem, Ohio (8).

India

Introductions from India were mid-season or earlier in showing first terminal leaves and bloom. Size of nuts and kernels from this source was good but in general some difficulty was experienced in extracting the kernels from the shell. Selection P.I. 265718 is noted for its very small irregularly shaped nut much resembling the nuts produced by the paradox hybrid walnut J. regia x J. hindsii.

Iran

Iranian introductions tended to leaf out and bloom early under Chico conditions. Nuts from this group tended to be large and yielded light amber kernels of good quality. Of particular interest is P.I. 125243 D38-3, for its large nuts, better than average kernel separation, and light colored meats.

Italy

The variety Sorrentina, P.I. 33189, a single introduction from Italy, yielded good crops of fair sized Eureka shaped nuts, having light amber colored kernels of good quality.

A tree of the Sorrentina variety budded to the Chinese wingnut Pterocarya stenoptera (13) planted in 1940 measures 7 feet 2 inches in circumference one foot above the bud union and is about 40 feet in height. Another tree of this variety propagated on J. hindsii, and planted in the same orchard in 1934, measures 9 feet in circumference one foot above the bud union and is about 50 feet in height. The tree on J. hindsii shows moderate overgrowth of the root, whereas the tree on P. stenoptera is still showing no overgrowth of either scion or stock.

Manchuria

The one introduction from Manchuria is early leafing and blooming, and has large size nuts with large light amber kernels of good quality.

Poland

The Polish introductions, from areas other than the Carpathian Mountains were the latest to show terminal leafing in the spring of any of the populations tested at Chico. Most of the nuts from this source were small. Some of the better selections are: P.I. 142327 with light colored kernels of good size and quality; P.I. 142331 with unusually large square shaped late maturing nuts somewhat like the Wilson Wonder type; P.I. 159548 with good nut quality and early maturity and P.I. 228149 with early maturity.

Seedlings representing 15 Polish selections have been killed by low temperatures at Morden, Canada, and frozen to the ground at Cheyenne, Wyoming. Some of the progeny of 5 of these same accessions are showing cold resistance at Salem, Ohio (8).

Walnuts from the Carpathian Mountains on the other hand are quite variable as to date of leafing and blossoming, season of maturity, and nut characteristics. As a group, however, they tended to be slightly later than mid-season for first terminal leafing. The average size of the nuts from this source was somewhat smaller than present commercial varieties. Their appearance, except for size, was generally good. Kernel color, however, tended to be dark, with 20 percent classified amber, 77 percent light amber, and 3 percent light. Selections from this source, of interest are: P.I. 265717 which combines late leafing with good nut and kernel size; P.I. 145967 bearing nuts of good size and very good quality; P.I. 145974 producing nuts notable for large kernels and early maturity; and P.I. 145979 an early maturing type with nuts of commercial size and good quality.

While seedlings of 12 accessions from this source failed to survive at Morden, Canada, a tree at Salem, Ohio, and three at Cheyenne, Wyoming, are showing some promise of being cold hardy.

USSR SOCHI DISTRICT

As a group the introductions from this area were about mid-season in terminal leafing. Selections of particular interest are P.I. 265715, P.I. 265712, and P.I. 265713 which bore nuts and kernels of large size and P.I. 265714 which is noted for early maturity and high percentage of kernel.

DISCUSSION

Bennett (2) studying the chilling requirements of pears found that alternating periods of cold and warm temperatures were not as effective in breaking the rest of leaf buds as continued cold without interruption, even though the total cumulative exposure was the same. In an experiment with the peach variety Sullivan Elberta Weinberger (12) likewise found that at certain periods during the dormant season, particularly December at Fort Valley, Georgia, the occurrence of high temperatures would prolong dormancy of this variety. In addition Serr (7) has recognized that some walnut varieties are capable of starting growth in the spring at lower temperatures than others.

Considering these findings of Bennett, Weinberger, and Serr, it appears that two separate factors were responsible for the prolonged leafing and blossoming period of 1948. First, the high temperatures of January apparently offset some of the previous chilling and tended to prolong the rest period. Secondly, the below average growing temperatures of March 48.6°F. as compared with an average of 54.5°F. delayed the early leafing of some individuals and slowed the growth rate for others, which then tended to lengthen the leafing and blossoming season.

Many of the seedlings which had leafed out early in 1948 apparently had their rest period broken by February 1, 1949, with an accumulation of 1480 hours below 45°F. The early-leafing seedlings were held back, however, by the low temperatures and cloudy wet weather which persisted from February 1 to March 21, there being only 11 clear days during this period. Ackerman et al., (1) recorded a similar delay in the blossoming of low chilling peaches and nectarines during this same season (1948-49). The additional accumulation of 501 hours of temperature below 45°F. between February and the end of March was apparently sufficient to break the rest period of the higher chilling types. With the advent of warm weather during the last part of March and early April all seedlings were able to leaf out and bloom during a relatively short period.

While most of these walnut introductions are inferior in one or more respects to commercial varieties grown in California, they are of increasing interest for potential cold hardiness. This is especially true of those from countries having severe winters such as Afghanistan, Bulgaria, Estonia, Manchuria, Poland, and the USSR. Although individual seedling characteristics are variable, a trend towards late leafing and blossoming can be noted in the Polish introductions. Also each of the four accessions from China produce large nuts with plump kernels and good crack out percentages. At least one from this source P.I. 125248 has shown blight resistance (7), and two others P.I. 125249 and P.I. 18256 produce large size and sometimes very good kernel quality when used in crosses (7). These data suggest the desirability of continuing to introduce walnuts from these sources for continued testing and potential use as breeding stock.

REFERENCES

1. Ackerman, W. L., Joley, L. E. and Halsey, D. 1955 Blossoming and leafing responses of foreign and domestic peaches and nectarines to temperature. Multilithed report prepared by the Division of Plant Exploration and Introduction U.S.D.A.
2. Bennett, J. P. 1949 Temperature and bud rest period effect of temperature and exposure on the rest period of deciduous plant leaf buds investigated. Calif. Agr. 3(11)9
3. Brown, G. B. 1960 Private correspondence
4. Davidson, T. P. 1960 Private correspondence
5. Michigan Nut Growers Association News Letter, December 1959 Stick with the Carpathians.
6. Pike, R. B. 1960 Private correspondence.
7. Serr, E. F. 1960 Private correspondence.
8. Spencer, C. A. 1958, 1960 Private correspondence.
9. Ure, C. R. 1960 Private correspondence.
10. United States Department of Agriculture. 1940 Plant Inventory No. 142:52, P.I. 135697.
11. Walnut Control Board Federal Marketing Order No. 84 Walnut Color Chart.
12. Weinberger, J. H. 1954 Effects of high temperatures during the breaking of the rest of Sullivan Elberta peach buds. Proc. Amer. Soc. Hort. Sci. 63: 157-162.
13. Whitehouse, W. E. and Joley, L. E. 1948 Notes on the growth of Persian walnut propagated on rootstocks of the Chinese wing-nut Pterocarya stenoptera Proc. Amer. Hort. Sci. 52: 103-106
14. Zager, T. G. 1956 Status of tree crops investigations in the Tennessee valley region. From the report of the Forty-Seventh annual meeting of the Northern Nut Growers Association.
15. Zielinski, Q. B. 1956 A three-year comparison of walnut rootstocks. Proceedings of the Forty-Second Annual Meeting of the Nut Society of Oregon and Washington, Forty-eighth Annual Report of the Oregon State Horticultural Society, Corvallis Oregon. pp. 215-216.

TABLE 1

Source, dates of first terminal leafing, full male and female bloom, dichogamy, yield, harvest season, and nut characteristics of a group of seedling walnut introductions grown at Chico, California

Source	P.I.No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom				Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernel ^e	Percent kernel	Average kernel weight in grams	Color of kernel ^f	Quality ^g
				1948	1949	1948	1949	1948	1949		19	19	19								
											48	49	58								
Afghanistan																					
"	159560	D 42-6	3/17	3/8	3/25	4/5	4/6	4/20	4/9	--	F	E	P	M	33	P	F	51	6	LA	G
"	127460	D 37-25	3/19	3/10	3/27	4/17	4/10	4/17	4/6	Pg	P	VG	P	M	31	F	P	--	-	A	F
"	127458	D 37-9	3/19	3/10	3/28	4/12	4/7	4/23	4/8	--	P	P	P	M	--	-	-	--	-	-	-
"	159567	D 42-14	3/19	3/10	3/28	4/5	4/5	4/23	4/13	Pa	F	G	P	E	33	F	F	45	7	LA	G
"	159559	D 42-3	3/20	3/10	3/30	4/20	4/15	4/17	4/9	Pg	P	VG	P	M	35	F	F	47	6	A	VG
"	127459	D 37-20	3/21	3/15	3/27	4/12	4/4	4/20	4/12	Pa	F	VG	G	E	32	P	F	47	5	LA	G
"	127460	D 42-22	3/21	3/15	3/27	4/12	4/3	4/26	4/12	Pa	P	G	P	L	34	P	F	52	7	A	VG
"	127461	D 37-36	3/22	3/15	3/29	----	---	----	4/15	--	-	P	P	-	33	P	F	50	5	LA	G
"	127459	D 42-9	3/23	3/19	3/27	4/10	4/4	4/20	4/14	Pa	P	P	P	E	31	P	G	--	-	LA	G
"	127459	D 42-7	3/23	3/15	3/30	4/8	4/8	4/20	4/15	Pa	P	P	P	M	34	P	F	46	6	LA	G

Key ^aDichogamy Pa- Protandrous - Shedding pollen before female flowers on the same tree are receptive
Pg- Protogynous - Female flowers receptive before pollen is shed
^bYield P-Poor F-Fair G-Good VG-Very Good E-Excellent
^cHarvest season E-Early M-Mid L-Late VL-Very Late
^dShape F-Franquette E-Eureka P-Payne
^eSeparation of kernel P-Poor F-Fair G-Good VG-Very Good
^fKernel color EL-Extra Light L-Light LA-Light Amber A-Amber
^gQuality P-Poor F-Fair G-Good VG-Very Good E-Excellent

Table 1 (Cont.)

Source	P. I. No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom		Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernels ^e	Percent kernel	Average kernel weight in grams	Color of kernel ^f	Quality ^g		
				1948	1949	1948	1949		1948	1949	19										
											48									49	58
Afghanistan																					
"	127458	D 37-12	3/23	3/19	3/27	4/10	4/6	4/26	4/14	Pa	F	G	P	M	33	F	F	41	5	A	G
"	127461	D 37-32	3/24	3/19	3/28	4/17	4/9	4/20	4/8	Pg	F	G	P	M	34	P	F	--	-	-	G
"	159563	D 37-14	3/24	3/19	3/29	4/23	4/9	4/20	4/8	Pg	P	G	P	M	33	P	F	51	7	LA	G
"	127459	D-42-2	3/24	3/19	3/29	----	4/10	4/20	4/9	Pg	P	G	P	M	33	P	G	45	6	LA	G
"	159566	D 42-12	3/24	3/19	3/28	4/12	4/5	4/23	4/13	Pa	F	F	P	E	31	F	G	44	4	L	G
"	159561	D 42-8	3/24	3/19	3/28	4/12	4/6	4/23	4/16	Pa	F	P	P	E	26	P	F	56	4	LA	G
"	127459	D 37-18	3/24	3/19	3/28	4/12	4/5	4/26	4/15	Pa	F	G	F	M	33	F	F	46	6	LA	G
"	159572	D 42-21	3/24	3/19	3/29	4/12	4/5	4/26	4/17	Pa	P	P	P	E	31	F	G	50	6	LA	G
"	159571	D 42-20	3/24	3/19	3/29	4/10	---	4/23	----	Pa	P	-	P	E	31	F	F	--	-	LA	P
"	127460	D 42-13	3/25	3/19	3/30	4/17	4/12	4/17	4/12	--	F	VG	P	E	30	P	F	48	5	L	G
"	127459	D 37-19	3/25	3/19	3/30	4/17	----	4/20	4/15	Pg	P	P	P	M	37	P	VG	44	5	LA	F
"	127459	D 42-4	3/25	3/19	3/30	4/10	4/8	4/23	4/15	Pa	F	VG	P	M	31	F	F	48	5	LA	G
"	159558	D 37-11	3/27	3/26	3/28	4/17	4/8	4/20	4/8	Pg	G	G	F	E	34	F	F	49	8	LA	G
"	127460	D 42-19	3/28	3/26	3/30	4/26	4/14	4/20	4/8	Pg	P	G	P	E	36	P	G	45	6	LA	G
"	127459	D 42-5	3/28	3/26	3/29	4/23	4/13	4/20	4/13	Pg	G	VG	P	M	33	P	F	38	5	A	G
"	127461	D 37-31	3/28	3/26	3/29	4/12	4/7	4/28	4/14	Pa	P	G	P	E	29	F	G	53	5	A	F
"	127461	D 37-34	3/29	3/30	3/28	----	---	4/20	4/12	--	P	P	G	M	37	P	-	--	-	-	G
"	159581	D 42-42	3/30	3/30	3/29	4/26	4/14	4/22	4/14	Pg	F	G	P	M	31	F	F	--	-	-	G
"	163538	D 42-43	3/30	3/30	3/30	5/1	4/16	4/23	4/12	Pg	F	P	P	E	36	P	F	48	6	LA	G
"	127459	D 37-17	3/30	3/30	3/29	----	4/6	4/26	4/12	Pa	P	G	G	M	33	P	F	51	6	A	G
"	127460	D 42-11	3/30	3/30	3/30	4/26	----	4/23	4/14	Pg	P	P	P	L	32	F	P	41	6	LA	F
"	159573	D 37-33	3/30	3/30	3/30	----	----	4/26	4/13	--	F	P	P	E	32	P	G	48	5	LA	G
"	127460	D 37-24	3/30	3/30	3/30	4/17	4/8	4/26	4/15	Pa	P	F	P	M	35	P	G	55	7	A	P



Table 1: Experimental Data									
Time (min)	Concentration (mg/L)	Time (min)	Concentration (mg/L)	Time (min)	Concentration (mg/L)	Time (min)	Concentration (mg/L)	Time (min)	Concentration (mg/L)
0	0.0	10	1.0	20	2.0	30	3.0	40	4.0
1	1.0	11	2.0	21	3.0	31	4.0	41	5.0
2	2.0	12	3.0	22	4.0	32	5.0	42	6.0
3	3.0	13	4.0	23	5.0	33	6.0	43	7.0
4	4.0	14	5.0	24	6.0	34	7.0	44	8.0
5	5.0	15	6.0	25	7.0	35	8.0	45	9.0
6	6.0	16	7.0	26	8.0	36	9.0	46	10.0
7	7.0	17	8.0	27	9.0	37	10.0	47	11.0
8	8.0	18	9.0	28	10.0	38	11.0	48	12.0
9	9.0	19	10.0	29	11.0	39	12.0	49	13.0
10	10.0	20	11.0	30	12.0	40	13.0	50	14.0
11	11.0	21	12.0	31	13.0	41	14.0	51	15.0
12	12.0	22	13.0	32	14.0	42	15.0	52	16.0
13	13.0	23	14.0	33	15.0	43	16.0	53	17.0
14	14.0	24	15.0	34	16.0	44	17.0	54	18.0
15	15.0	25	16.0	35	17.0	45	18.0	55	19.0
16	16.0	26	17.0	36	18.0	46	19.0	56	20.0
17	17.0	27	18.0	37	19.0	47	20.0	57	21.0
18	18.0	28	19.0	38	20.0	48	21.0	58	22.0
19	19.0	29	20.0	39	21.0	49	22.0	59	23.0
20	20.0	30	21.0	40	22.0	50	23.0	60	24.0
21	21.0	31	22.0	41	23.0	51	24.0	61	25.0
22	22.0	32	23.0	42	24.0	52	25.0	62	26.0
23	23.0	33	24.0	43	25.0	53	26.0	63	27.0
24	24.0	34	25.0	44	26.0	54	27.0	64	28.0
25	25.0	35	26.0	45	27.0	55	28.0	65	29.0
26	26.0	36	27.0	46	28.0	56	29.0	66	30.0
27	27.0	37	28.0	47	29.0	57	30.0	67	31.0
28	28.0	38	29.0	48	30.0	58	31.0	68	32.0
29	29.0	39	30.0	49	31.0	59	32.0	69	33.0
30	30.0	40	31.0	50	32.0	60	33.0	70	34.0
31	31.0	41	32.0	51	33.0	61	34.0	71	35.0
32	32.0	42	33.0	52	34.0	62	35.0	72	36.0
33	33.0	43	34.0	53	35.0	63	36.0	73	37.0
34	34.0	44	35.0	54	36.0	64	37.0	74	38.0
35	35.0	45	36.0	55	37.0	65	38.0	75	39.0
36	36.0	46	37.0	56	38.0	66	39.0	76	40.0
37	37.0	47	38.0	57	39.0	67	40.0	77	41.0
38	38.0	48	39.0	58	40.0	68	41.0	78	42.0
39	39.0	49	40.0	59	41.0	69	42.0	79	43.0
40	40.0	50	41.0	60	42.0	70	43.0	80	44.0
41	41.0	51	42.0	61	43.0	71	44.0	81	45.0
42	42.0	52	43.0	62	44.0	72	45.0	82	46.0
43	43.0	53	44.0	63	45.0	73	46.0	83	47.0
44	44.0	54	45.0	64	46.0	74	47.0	84	48.0
45	45.0	55	46.0	65	47.0	75	48.0	85	49.0
46	46.0	56	47.0	66	48.0	76	49.0	86	50.0
47	47.0	57	48.0	67	49.0	77	50.0	87	51.0
48	48.0	58	49.0	68	50.0	78	51.0	88	52.0
49	49.0	59	50.0	69	51.0	79	52.0	89	53.0
50	50.0	60	51.0	70	52.0	80	53.0	90	54.0
51	51.0	61	52.0	71	53.0	81	54.0	91	55.0
52	52.0	62	53.0	72	54.0	82	55.0	92	56.0
53	53.0	63	54.0	73	55.0	83	56.0	93	57.0
54	54.0	64	55.0	74	56.0	84	57.0	94	58.0
55	55.0	65	56.0	75	57.0	85	58.0	95	59.0
56	56.0	66	57.0	76	58.0	86	59.0	96	60.0
57	57.0	67	58.0	77	59.0	87	60.0	97	61.0
58	58.0	68	59.0	78	60.0	88	61.0	98	62.0
59	59.0	69	60.0	79	61.0	89	62.0	99	63.0
60	60.0	70	61.0	80	62.0	90	63.0	100	64.0
61	61.0	71	62.0	81	63.0	91	64.0		
62	62.0	72	63.0	82	64.0	92	65.0		
63	63.0	73	64.0	83	65.0	93	66.0		
64	64.0	74	65.0	84	66.0	94	67.0		
65	65.0	75	66.0	85	67.0	95	68.0		
66	66.0	76	67.0	86	68.0	96	69.0		
67	67.0	77	68.0	87	69.0	97	70.0		
68	68.0	78	69.0	88	70.0	98	71.0		
69	69.0	79	70.0	89	71.0	99	72.0		
70	70.0	80	71.0	90	72.0				
71	71.0	81	72.0						
72	72.0	82	73.0						
73	73.0	83	74.0						
74	74.0	84	75.0						
75	75.0	85	76.0						
76	76.0	86	77.0						
77	77.0	87	78.0						
78	78.0	88	79.0						
79	79.0	89	80.0						
80	80.0	90	81.0						
81	81.0	91	82.0						
82	82.0	92	83.0						
83	83.0	93	84.0						
84	84.0	94	85.0						
85	85.0	95	86.0						
86	86.0	96	87.0						
87	87.0	97	88.0						
88	88.0	98	89.0						
89	89.0	99	90.0						
90	90.0								
91	91.0								
92	92.0								
93	93.0								
94	94.0								
95	95.0								
96	96.0								
97	97.0								
98	98.0								
99	99.0								
100	100.0								

Table 1 (Cont.)

Source	P. I. No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom				Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernel ^e	Percent kernel	Average kernel weight in grams	Color of kernel ^f	Quality ^g
				1948	1949	1948	1949	1948	1949		19	19	19								
Afghanistan																					
"	159568	D 42-15	3/30	3/30	3/29	4/12	4/4	4/26	4/16	Pa	F	VG	P	E	33	F	G	53	7	LA	F
"	159569	D 42-16	3/31	3/30	4/1	5/4	4/15	4/20	4/13	Pg	P	F	P	E	33	F	F	54	7	LA	G
"	127460	D 37-29	3/31	3/30	4/1	4/12	4/8	4/26	4/13	Pa	P	G	P	E	28	F	F	41	4	LA	G
"	127460	D 42-17	3/31	3/30	3/31	4/23	4/13	4/23	4/12	Pg	P	F	P	E	34	P	F	47	6	LA	F
"	116932	D 37-38	4/1	3/30	4/2	4/12	----	4/26	4/7	Pa	-	P	P	-	--	-	-	--	-	--	-
"	127460	D 37-28	4/3	4/7	3/30	4/26	4/13	4/26	4/11	Pg	P	F	P	E	32	P	F	46	6	LA	G
"	159557	D 37-10	4/3	4/7	3/30	4/26	4/14	4/26	4/18	Pg	G	G	P	E	36	P	F	--	-	LA	VG
"	159562	D 37-13	4/4	4/7	4/1	4/26	4/8	4/26	4/15	--	G	E	VG	M	33	P	G	47	5	L	G
"	265720	D 42-45	4/4	4/7	4/1	----	4/10	4/26	4/18	Pg	P	F	P	M	34	F	VG	42	6	LA	G
"	163539	D 42-44	4/5	4/10	3/31	----	4/10	5/4	4/17	Pa	P	F	P	E	36	F	F	47	7	L	G
"	127460	D 37-30	4/6	4/10	4/2	4/20	4/8	5/5	4/18	Pa	F	G	P	M	35	F	P	40	6	LA	G
"	127460	D 37-26	4/7	4/12	4/2	4/26	4/10	5/6	4/16	Pa	P	P	P	M	32	P	G	54	6	LA	F
Algeria																					
"	61855	D 35-9	3/25	3/19	3/30	4/17	4/7	5/1	4/14	Pa	F	G	F	E	34	F	-	48	6	A	G
Bulgaria																					
"	107627	D 35-12	3/30	3/30	3/30	5/1	4/17	4/23	4/13	Pg	F	P	P	M	28	F	G	50	4	A	F
"	107627	D 35-11	3/31	3/30	4/1	4/23	4/12	5/1	4/12	--	P	-	F	E	32	F	F	43	4	A	F
Chile																					
"	265716	D 35-7	3/24	3/19	3/29	4/10	4/7	4/23	4/14	Pa	F	VG	P	E	30	F	F	52	6	LA	G

Table 1 (Cont.)

Source	P. I. No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom		Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernel ^e	Percent kernel	Average kernel weight in grams	Color of kernel ^f	Quality ^g		
				1948	1949	1948	1949		1948	1949	19									19	19
				48	49	58															
China																					
"	125248	D 18-5	3/22	3/15	3/28	4/7	4/7	4/26	4/11	--	VG	VG	G	E	38	F	G	49	7	L	G
"	125249	D 18-6	3/24	3/19	3/29	4/17	4/11	4/17	4/10	Pg	VG	G	F	E	36	P	G	54	8	LA	G
"	125239	D 36-34	3/26	3/26	----	4/28	----	4/20	----	Pg	E	-	G	M	40	P	G	48	7	A	G
Estonia																					
"	159578	D 42-33	3/30	3/30	3/30	4/17	4/7	4/26	4/15	Pa	G	G	P	L	27	P	F	45	4	LA	G
"	265719	D 42-30	4/3	4/7	3/29	4/17	4/8	5/6	4/15	Pa	G	F	P	L	27	F	VG	55	4	L	F
"	131353	D 42-31	4/4	4/7	3/31	4/17	4/9	5/6	4/18	Pa	G	F	P	L	30	F	F	52	6	LA	G
"	131353	D 42-35	4/6	4/10	4/1	4/22	4/11	4/28	4/15	Pa	G	F	P	L	27	F	F	49	4	LA	G
"	131353	D 42-34	4/7	4/12	4/2	5/1	4/17	4/26	4/11	Pg	P	F	P	M	34	F	F	43	6	A	G
"	131353	D 42-32	4/12	4/17	4/6	5/4	----	4/26	4/18	Pg	F	P	P	M	--	-	F	--	-	LA	G
India																					
"	54788	D 35-42	3/17	3/10	3/23	3/30	4/2	----	4/18	Pa	-	P	P	-	35	F	P	--	-	LA	P
"	125246	D 36-41	3/19	3/19	----	4/23	----	4/17	----	Pg	VG	-	P	M	32	F	G	51	7	LA	F
"	63430	D 36-42	3/24	3/24	----	4/11	----	4/17	----	Pa	P	-	P	M	30	F	F	51	6	LA	G
"	63430	D 36-43	3/26	3/26	----	----	----	----	----	--	P	-	P	M	32	F	F	43	7	A	G
"	265718	D 35-43	4/8	4/10	4/5	----	----	5/2	4/12	--	-	F	P	-	Irregular	P	--	-	-	LA	F
Iran																					
"	125247	D 38-5	3/22	3/19	3/25	4/12	4/6	4/26	4/13	Pa	G	F	P	L	33	F	F	52	7	LA	G
"	125247	D 38-6	3/23	3/19	3/27	4/10	4/5	4/26	4/13	Pa	VG	G	P	L	31	F	F	--	-	LA	F
"	125243	D 38-3	3/23	3/19	3/27	4/17	4/9	4/17	4/10	Pg	G	G	P	M	38	P	VG	53	9	L	G

Table 1 (Cont.)

Source	P. I. No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom		Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernel ^e	Percent kernel	Average kernel weight in grams	Color of kernel ^f	Quality ^g		
				1948	1949	Male	Female		1948	1949	19									19	19
									48	49	58										
Iran																					
"	125243	D 38-4	3/24	3/19	3/28	4/17	4/10	4/17	4/10	Pg	F	F	P	M	35	P	G	51	5	LA	G
"	125245	D 18-10	3/30	3/30	3/29	4/17	4/9	4/26	4/15	Pa	P	VG	P	L	30	F	VG	50	5	LA	G
Manchuria																					
"	125240	D 18-3	3/24	3/19	3/28	4/7	4/6	4/20	4/11	Pa	VG	E	P	M	35	P	G	45	7	LA	G
Poland																					
"	159555	D 37-1	3/28	3/26	3/30	4/12	4/8	4/26	4/17	Pa	G	E	P	L	28	F	F	34	3	A	F
"	142325	D 36-29	3/29	3/26	3/ 1	4/23	4/14	4/23	4/17	Pg	F	P	F	L	32	F	P	45	5	LA	F
"	125194	D 35-4	3/31	3/30	3/31	4/23	4/12	4/23	4/12	Pg	P	P	P	M	30	F	VG	47	4	LA	G
"	142331	D 38-9	3/31	3/30	3/31	----	4/14	4/23	4/13	Pg	G	F	P	L	40 square	F		29	6	LA	G
"	142330	D 37-4	3/31	3/30	4/1	4/23	4/17	4/26	4/12	Pg	F	P	P	M	28	P	P	--	-	LA	G
"	159543	D 35-3 N. limb	3/31	3/30	3/31	4/20	4/10	4/23	4/17	Pg	P	P	P	E	--	-	-	--	-	-	G
"	159548	D 36-15	4/2	3/30	4/4	4/28	4/20	4/23	4/14	Pg	F	P	P	E	30	F	F	50	5	LA	G
"	159549	D 36-18	4/3	4/5	4/1	4/28	4/17	4/23	4/11	Pg	VG	P	G	L	31	P	F	42	4	A	G
"	125193	D 36-9	4/4	4/7	4/1	4/28	4/15	4/23	4/11	Pg	P	P	P	L	--	-	G	--	-	LA	F
"	159556	D 42-39	4/5	4/7	4/2	----	4/15	4/26	4/15	--	G	G	P	L	30	F	F	34	4	LA	G
"	159554	D 36-32	4/5	4/5	----	4/23	----	4/23	----	Pg	P	-	F	L	29	F	F	43	4	LA	G
"	142321	D 36-25	4/5	4/11	3/29	4/23	4/7	5/6	4/14	Pa	F	P	F	L	29	F	F	41	5	LA	G
"	159550	D 36-19	4/5	4/5	4/4	----	4/9	5/6	4/16	--	P	P	F	E	27	F	P	--	-	LA	G
"	142323	D 36-27	4/6	4/10	4/1	5/4	4/18	5/3	4/11	Pg	P	P	F	M	31	F	F	52	6	LA	G
"	125194	D 36-10	4/6	4/10	4/1	4/23	4/9	5/3	4/16	Pa	F	G	P	L	27	P	P	--	-	LA	G

Table 1 (Cont.)

Source	P. I. No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom		Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernel ^e	Percent kernel	Average kernel weight in grams	Color of kernel ^f	Quality ^g			
				1948	1949	Male	Female		1948	1949	1948									1949	1948	1949
Poland																						
"	125194	D 36-13	4/6	4/11	4/1	4/23	4/9	5/4	4/14	Pa	P	P	P	M	30	F	F	38	3	LA	G	
"	142320	D 36-24	4/6	4/11	4/1	4/20	4/10	5/6	4/17	Pa	F	F	F	M	28	F	F	48	5	LA	G	
"	159545	D 36-11	4/6	4/10	4/1	4/23	4/9	5/5	4/17	Pa	G	G	P	M	28	F	P	--	-	LA	G	
"	142328	D 37-2	4/6	4/10	4/2	4/22	4/8	5/6	4/18	Pa	F	VG	F	L	32	F	G	43	5	LA	G	
"	142322	D 36-26	4/7	4/12	4/1	5/6	4/18	4/23	4/15	Pg	P	P	P	M	34	P	F	49	6	A	F	
"	142329	D 37-3	4/7	4/7	4/6	4/22	4/12	5/6	4/19	Pa	F	F	F	L	25	P	P	--	-	LA	F	
"	159552	D 36-22	4/8	4/11	4/4	5/5	4/17	4/23	4/14	Pg	G	F	G	L	29	F	F	49	5	LA	G	
"	142324	D 36-28	4/8	4/11	4/4	4/23	4/10	5/5	4/16	Pa	G	F	G	L	--	-	F	--	-	A	P	
"	125194	D 36-17	4/10	4/19	3/31	----	4/8	5/6	4/17	Pa	G	F	F	VL	28	P	F	36	3	LA	G	
"	142327	D 36-31	4/10	4/10	----	5/3	----	5/8	----	Pg	P	-	-	L	35	F	VG	43	6	L	G	
"	159551	D 36-20	4/11	4/17	4/4	4/28	4/12	----	4/18	Pa	F	P	F	M	31	F	P	50	6	LA	G	
"	142326	D 36-30	4/11	4/17	4/3	5/6	4/18	5/6	4/14	Pg	P	P	P	M	33	P	F	--	-	-	G	
"	125194	D 36-16	4/11	4/17	4/4	5/6	4/17	5/6	4/16	Pg	P	P	P	M	31	F	VP	--	-	LA	G	
"	159553	D 36-23	4/11	4/17	4/5	4/23	4/11	5/6	4/17	Pa	F	G	G	L	30	P	F	33	4	LA	G	
"	159546	D 36-12	4/12	4/17	4/6	4/23	4/14	5/6	4/16	Pa	F	F	F	M	31	F	P	29	4	LA	G	
"	159547	D 36-14	4/12	4/17	4/6	5/5	----	5/5	4/17	Pg	P	P	P	M	36	F	G	--	-	--	G	
"	159544	D 36-7	4/13	4/19	4/6	----	4/15	5/6	4/19	Pa	F	G	G	E	27	F	F	45	4	LA	G	
"	228149	D 36-21	4/14	4/19	4/8	5/5	----	5/6	4/18	Pg	P	P	P	E	30	F	G	47	5	LA	F	
Carpathian Mountains																						
"	110036	D 35-34	3/19	3/10	3/27	4/17	4/11	4/17	4/7	--	F	G	P	E	33	F	P	42	5	A	F	
"	145973	D 35-25	3/23	3/19	3/27	4/7	4/6	4/23	4/9	Pa	F	VG	P	M	31	P	G	54	6	LA	G	

Table 1 (Cont.)

Source	P. I. No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom		Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernel ^e	Percent kernel	Average kernel weight in grams	Color of kernel ^f	Quality ^g		
				1948	1949	1948	1949		1948	1949	19									19	19
Carpathian Mountains																					
"	145971	D 35-22	3/25	3/19	3/30	4/19	4/10	4/23	4/16	Pa	G	G	F	M	32	F	F	50	5	LA	F
"	145976	D 35-31	3/27	3/26	3/28	4/26	4/12	4/23	4/8	Pg	F	P	P	L	32	P	P	54	7	LA	G
"	145968	D 35-15	3/27	3/26	3/28	4/17	----	5/6	4/15	Pa	G	G	P	M	33	F	P	46	7	LA	F
"	110049	D 36-3	3/28	3/26	3/29	4/7	4/6	4/23	4/11	Pa	F	P	P	M	32	F	F	40	5	LA	F
"	145974	D 35-26	3/28	3/26	3/30	5/1	4/14	4/20	4/13	Pg	F	P	P	E	31	E	G	49	7	LA	F
"	159542	D 35-35	3/30	3/30	3/29	----	4/14	4/20	4/15	Pg	F	F	F	L	31	F	F	34	5	LA	G
"	110044	D 35-39	3/30	3/30	3/30	4/23	4/15	4/23	4/15	Pg	-	-	G	-	31	F	G	41	4	LA	P
"	145972	D 35-24	3/30	3/30	3/29	4/19	4/7	5/1	4/15	Pa	F	G	P	M	31	F	F	36	4	LA	G
"	110026	D 35-20	3/30	3/30	3/30	4/19	----	5/3	4/16	Pa	F	F	P	M	30	F	F	43	5	LA	G
"	110048	D 36-1	3/31	3/30	4/1	4/20	4/15	4/20	4/14	--	F	P	P	L	34	F	P	44	6	LA	G
"	145979	D 36-4	3/31	3/30	4/1	4/20	4/12	4/23	4/10	Pg	F	P	P	E	33	E	G	48	6	LA	G
"	110037	D 35-36	3/31	3/30	4/1	----	4/16	4/23	4/12	--	P	P	F	E	31	F	G	54	5	LA	F
"	145967	D 35-13	3/31	3/30	3/31	4/23	4/13	4/23	4/13	Pg	G	P	F	L	32	F	G	44	6	LA	VG
"	110028	D 35-23	3/31	3/30	3/31	4/19	----	4/23	4/14	Pa	VG	VG	F	M	28	F	F	--	-	LA	G
"	145978	D 36-2	3/31	3/30	4/1	4/19	4/9	5/1	4/15	Pa	F	G	P	E	34	F	G	55	5	LA	G
"	110032	D 35-30	4/2	4/5	3/29	4/28	4/12	4/23	4/13	Pg	F	F	P	M	31	F	P	45	6	A	G
"	110031	D 35-29	4/3	4/5	3/31	4/26	4/17	4/26	4/13	Pg	F	-	P	L	29	P	F	39	4	A	P
"	110045	D 35-40	4/3	4/5	3/31	4/15	4/10	5/4	4/17	Pa	F	P	G	L	30	F	P	36	5	A	F
"	110033	D 35-33	4/4	4/7	4/1	----	4/11	5/6	4/18	Pa	F	F	P	E	27	F	F	41	3	A	F
"	145970	D 35-19	4/6	4/10	4/1	5/3	4/17	4/23	4/13	Pg	G	VG	P	E	32	F	G	45	5	LA	G
"	110051	D 36-5	4/6	4/7	4/4	4/20	4/9	5/4	4/16	Pa	G	VG	G	M	29	F	P	40	3	LA	F
"	110022	D 35-14	4/6	4/10	4/1	4/17	----	5/6	4/18	Pa	F	G	P	L	26	F	F	42	4	LA	G
"	145977	D 35-32	4/6	4/10	4/1	5/1	4/12	5/6	4/18	--	F	VG	F	M	31	F	F	45	5	LA	G
"	265717	D 35-38	4/6	4/7	4/4	---	----	5/6	----	Pa	P	F	F	M	32	F	G	50	6	LA	G
"	110024	D 35-17	4/8	4/10	4/6	4/23	----	5/6	----	Pa	F	VG	P	M	27	P	P	32	3	LA	F

Table 1 (Cont.)

Source	P.I.No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom		Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernel ^e	Percent kernel	Average kernel weight in grams ^f	Color of kernel ^f	Quality ^g		
				1948	1949	Male	Female		19	19	19										
				1948	1949	1948	1949		48	49	58										
Carpathian Mountains																					
"	110027	D 35-21	4/8	4/10	4/6	4/23	4/12	5/6	4/18	Pa	G	VG	F	L	28	F	G	52	5	LA	G
"	145969	D 35-16	4/8	4/10	4/5	4/23	----	5/6	4/18	Pa	G	VG	P	E	28	F	G	44	4	L	G
"	159541	D 35-18	4/8	4/10	4/5	5/1	4/18	4/23	4/15	Pg	G	G	P	E	30	P	G	35	4	A	F
USSR																					
"	128825	D 42-41	3/30	3/30	3/30	4/17	4/9	4/26	4/17	--	G	VG	P	M	30	E	G	50	5	LA	F
"	98238	D 18-1	4/12	4/20	4/4	----	----	----	----	--	P	P	P	VL	33	P	F	48	5	LA	F
USSR Sochi Dist.																					
"	102089	D 18-21	3/23	3/19	3/27	4/10	4/8	4/26	4/12	Pa	P	G	P	L	30	P	F	45	3	A	G
"	102091	D 18-22	3/23	3/19	3/27	4/23	4/10	4/26	4/13	Pg	F	P	P	L	28	F	P	38	4	LA	G
"	265714	D 18-24	3/24	3/19	3/29	4/10	4/8	4/20	4/13	Pa	P	F	P	E	31	F	F	55	5	LA	G
"	102091	D 19-10	3/26	3/26	----	4/10	----	4/26	----	Pa	-	-	P	-	30	F	G	46	5	A	G
"	265712	D 18-20	3/27	3/26	3/28	4/26	4/11	4/20	4/12	Pg	P	P	P	M	34	F	F	50	6	LA	G
"	145984	D 18-17	3/28	3/26	3/29	4/15	4/6	4/26	4/12	Pa	F	-	P	M	31	P	F	47	5	LA	F
"	265713	D 18-23	3/29	3/26	4/1	4/17	4/9	4/26	4/16	Pa	P	P	P	M	32	F	F	49	6	LA	G
"	102096	D 19-17	3/30	3/30	----	----	----	4/26	----	Pa	P	-	P	M	29	P	F	52	5	LA	F
"	102095	D 18-25	4/3	4/5	3/31	----	4/9	4/26	4/15	--	F	F	P	M	30	P	P	42	4	LA	G
"	102094	D 19-14	4/5	4/5	----	----	----	4/26	----	--	F	-	F	L	31	F	P	54	6	LA	F
"	102092	D 19-11	4/7	4/7	----	5/3	----	4/26	----	--	G	-	P	L	33	P	P	--	-	LA	G
"	102087	D 19-9	4/10	4/10	----	4/26	----	5/6	----	Pa	F	-	P	L	30	P	F	51	5	A	G
"	265715	D 19-8	4/10	4/10	----	4/22	----	4/20	----	--	F	-	P	L	35	P	VG	52	6	LA	F
"	102092	D 19-12	4/17	4/17	----	4/26	----	5/6	----	Pa	P	-	P	VL	27	F	F	39	3	LA	F
USSR Caucasus region																					
"	100276	D 18-15	4/3	4/5	4/1	4/15	4/11	5/6	4/16	Pa	P	F	P	M	31	F	G	50	5	LA	F

Table 1 (Cont.)

Source	P. I. No.	Location	Average date first terminal leaf	Date of first terminal leaf		Date of full bloom		Dichogamy ^a	Yield ^b			Harvest season ^c	Average diameter of nut in mm	Shape of nut ^d	Separation of kernel ^e	Percent kernel	Average kernel weight in grams	Color of kernel ^f	Quality ^g		
				1948	1949	Male	Female		1948	1949	19									19	19
				1948	1949	1948	1949		48	49	58										
STANDARDS																					
Wheeler Franquette																					
"	C19447	D 38-2	4/20	4/26	4/14	----	----	----	----	--	P	F	F	L	31	F	G	45	5	LA	G
"	C19447	D 38-1	4/21	4/26	4/15	----	----	----	----	--	P	F	-	L	31	F	F	43	4	LA	G
"	C19447	D 35-45	4/22	4/30	4/14	----	4/18	----	----	--	VG	VG	F	L	33	F	G	51	5	L	G
Manregian ¹																					
"	18256	D 35-1	3/27	3/26	3/28	4/10	4/7	4/23	4/11	Pa	P	P	P	M	42	F	G	53	9	LA	G
Sorrentina ²																					
"	33189	D 42-1	3/31	3/30	3/31	4/23	4/8	4/28	4/17	Pa	P	VG	-	M	29	E	F	37	4	L	G
Hartley ³																					
"	-----	-----	-----	-----	-----	-----	---	-----	-----	--	-	-	-	-	35	-	G	47	6	L	G
Franquette ³																					
"	-----	-----	-----	-----	-----	-----	---	-----	-----	--	-	-	-	-	31	-	G	46	5	LA	G
Eureka ³																					
"	-----	-----	-----	-----	-----	-----	---	-----	-----	--	-	-	-	-	33	-	G	48	8	LA	G
Payne ³																					
"	-----	-----	-----	-----	-----	-----	---	-----	-----	--	-	-	-	-	33	-	VG	48	5	LA	G

¹on Juglans honorii rootstock

²on Pterocarya stenoptera rootstock - see reference (5)

³1958 crop from local sources

1911 1912



															1911		1912		1913		1914		1915		1916		1917		1918		1919		1920		1921		1922		1923		1924		1925		1926		1927		1928		1929		1930		1931		1932		1933		1934		1935		1936		1937		1938		1939		1940		1941		1942		1943		1944		1945		1946		1947		1948		1949		1950		1951		1952		1953		1954		1955		1956		1957		1958		1959		1960		1961		1962		1963		1964		1965		1966		1967		1968		1969		1970		1971		1972		1973		1974		1975		1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030		2031		2032		2033		2034		2035		2036		2037		2038		2039		2040		2041		2042		2043		2044		2045		2046		2047		2048		2049		2050		2051		2052		2053		2054		2055		2056		2057		2058		2059		2060		2061		2062		2063		2064		2065		2066		2067		2068		2069		2070		2071		2072		2073		2074		2075		2076		2077		2078		2079		2080		2081		2082		2083		2084		2085		2086		2087		2088		2089		2090		2091		2092		2093		2094		2095		2096		2097		2098		2099		2100		2101		2102		2103		2104		2105		2106		2107		2108		2109		2110		2111		2112		2113		2114		2115		2116		2117		2118		2119		2120		2121		2122		2123		2124		2125		2126		2127		2128		2129		2130		2131		2132		2133		2134		2135		2136		2137		2138		2139		2140		2141		2142		2143		2144		2145		2146		2147		2148		2149		2150		2151		2152		2153		2154		2155		2156		2157		2158		2159		2160		2161		2162		2163		2164		2165		2166		2167		2168		2169		2170		2171		2172		2173		2174		2175		2176		2177		2178		2179		2180		2181		2182		2183		2184		2185		2186		2187		2188		2189		2190		2191		2192		2193		2194		2195		2196		2197		2198		2199		2200		2201		2202		2203		2204		2205		2206		2207		2208		2209		2210		2211		2212		2213		2214		2215		2216		2217		2218		2219		2220		2221		2222		2223		2224		2225		2226		2227		2228		2229		2230		2231		2232		2233		2234		2235		2236		2237		2238		2239		2240		2241		2242		2243		2244		2245		2246		2247		2248		2249		2250		2251		2252		2253		2254		2255		2256		2257		2258		2259		2260		2261		2262		2263		2264		2265		2266		2267		2268		2269		2270		2271		2272		2273		2274		2275		2276		2277		2278		2279		2280		2281		2282		2283		2284		2285		2286		2287		2288		2289		2290		2291		2292		2293		2294		2295		2296		2297		2298		2299		2300		2301		2302		2303		2304		2305		2306		2307		2308		2309		2310		2311		2312		2313		2314		2315		2316		2317		2318		2319		2320		2321		2322		2323		2324		2325		2326		2327		2328		2329		2330		2331		2332		2333		2334		2335		2336		2337		2338		2339		2340		2341		2342		2343		2344		2345		2346		2347		2348		2349		2350		2351		2352		2353	
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--	------	--

Table 2

Relationship between source and number of seedlings showing first terminal leafing by date for 1948 and 1949

[illegible][illegible]



Table 2 (Cont.)

Relationship between source and number of seedlings
showing first terminal leafing by date for 1948 and 1949

[illegible]

CHAPTER 1

1.1. The first part of the chapter is devoted to the study of the properties of the function $f(x)$ defined by the equation $f(x) = x^2 + 1$. It is shown that this function is strictly increasing on the interval $(0, \infty)$ and strictly decreasing on the interval $(-\infty, 0)$. Moreover, it is proved that the function $f(x)$ is convex on the interval $(0, \infty)$ and concave on the interval $(-\infty, 0)$.

1.2. In the second part of the chapter, we consider the function $f(x) = x^2 + 1$ and its derivative $f'(x) = 2x$. It is shown that the function $f(x)$ has a minimum at $x = 0$ and that the derivative $f'(x)$ is zero at $x = 0$. Moreover, it is proved that the function $f(x)$ is strictly increasing on the interval $(0, \infty)$ and strictly decreasing on the interval $(-\infty, 0)$.

$$\begin{array}{r} 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \\ 1 \ 1 \ 1 \ 1 \ 1 \end{array}$$

Table 1.1	
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100
11	121
12	144
13	169
14	196
15	225
16	256
17	289
18	324
19	361
20	400

Table 3

Weather data in monthly periods
between September 1st and April 30th
during the years 1947-48 and 1948-49

Month	Average Temperature Degrees Fahrenheit with departure from normal				Total Precipitation (inches) and departures from normal				Accumulative Summa- tions of hours of temp. below 45°F	
	1947-48		1948-49		1947-48		1948-49		1947-48	1948-49
	Temp.	Departure	Temp.	Departure	Precip.	Departure	Precip.	Departure		
Sept.	74.9	2.1	70.3	-2.5	T	-0.50	.22	-0.28	2	12
Oct.	62.2	-1.7	62.7	-1.2	5.38	4.11	.33	-0.94	10	61
Nov.	49.4	-3.8	51.6	-1.6	1.98	-0.71	1.33	-1.36	312	316
Dec.	43.9	-2.6	42.5	-4.0	2.05	-2.48	4.73	.20	798	838
Jan.	48.8	2.9	37.5	-8.4	2.51	-2.35	.91	-3.95	1107	1480
Feb.	46.8	-2.3	45.6	-3.5	1.56	-2.69	1.84	-2.41	1444	1814
Mar.	48.6	-5.9	51.6	-2.9	5.18	2.03	8.38	5.23	1710	1981
April	52.9	-7.1	62.5	2.5	5.37	1.97	T	-1.76	1829	2021

